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Indian Standard

SPECIFICATION FOR APPLIANCE-CONNECTORS AND APPLIANCE-INLETS (NON-REVERSIBLE THREE-PIN TYPE)

PART I APPLIANCE-CONNECTORS

First Reprint NOVEMBER 1976
(Incorporating Amendments No. 1, 2 and 3)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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SPECIFICATION FOR APPLIANCE-CONNECTORS AND APPLIANCE-INLETS (NON-REVERSIBLE THREE-PIN TYPE)

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Indian Standard

SPECIFICATION FOR APPLIANCE-CONNECTORS AND APPLIANCE-INLETS (NON-REVERSIBLE THREE-PIN TYPE)

PART I APPLIANCE-CONNECTORS

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 22 May 1965, after the draft finalized by the Electrical Appliances and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard covers appliance-connectors and appliance-inlets for portable electrical appliances which are non-reversible and in which the earthing contact is not exposed. Part I of this standard gives the detailed requirements for appliance-connectors while Part II covers those of appliance-inlets.

0.2.1 The two-pin with earthing clip type appliance-connectors and appliance-inlets have been considered non-standard in view of their reversible nature and also the ineffectiveness of their earthing contacts; hence use of such appliance-connectors and inlets is deprecated. All appliances should be designed with three-pin appliance-inlets only, capable of accommodating the three-pin appliance-connector, conforming to this standard.

0.3 This standard (Part I) specifies the dimensions of connector (attached to flexible cord) to ensure interchangeability with the appliance-inlet mounted on or forming integral part of a portable electrical appliance. Performance and safety requirements as well as tests to check compliance with these are also included in this standard. The connectors, being non-reversible, may be used with appliances incorporating a single-pole switch, provided it is ensured that the switch comes on the live line.

0.4 Assistance has been derived from the following while preparing this specification:

IEC Doc : 23 (Secretariat) 58 Recommendation for a specification for appliance couplers for domestic and similar general purposes. International Electrotechnical Commission.

CEE Publication 22 - 1962 Appliance couplers for domestic and similar general purposes. International Commission on Rules for the Approval of Electrical Equipment.

SAAC 109 - 1955 Appliance plugs and appliance inlet-sockets. Standards Association of Australia.

B.S. 3283 : 1960 Non-reversible connectors and appliance inlets for portable electrical appliances : Part 1 13A connector and appliance inlet. British Standards Institution.

B.S. 3283 : Part 2 : 1963 Non-reversible connectors and appliance inlets : Part 2 6A connector and appliance inlet. British Standards Institution.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part I) covers non-reversible three-pin appliance-connectors (2-pole and earth) rated at 5A and 15A at 250 V for portable electrical appliances.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions given below shall apply in addition to those specified in IS : 302 - 1973†.

2.1 Appliance-Connector — A device, incorporating current-carrying contacts and earthing contacts, arranged for the attachment to a flexible cord, for connecting the supply to portable electrical appliance(s) by insertion into an appliance-inlet.

Note — Any component provided for the protection of the flexible cord at the point of entry to the connector is regarded as part of the connector.

2.2 Current-Carrying Contacts of the Appliance-Connector — The metallic contacts in the connector which engage with the current-carrying pins of the appliance-inlet.

2.3 Earthing Contact of the Appliance-Connector — The metallic contact for ensuring electrical connection between the earthing terminal of the connector and the corresponding pin of the appliance-inlet when the appliance-connector is inserted into the appliance-inlet.

2.4 Appliance-Inlet — A device which incorporates pins and is mounted on, or forms an integral part of the portable electrical appliance.

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*Rules for rounding off numerical values (*revised*).

†General and safety requirements for household and similar electrical appliances (*fourth revision*).

2.5 Cord-Grip — A device for securing the flexible cord where it enters that portion of the connector in which the cord protecting sleeve is attached.

2.6 Cord Guard — A rubber or non-flammable plastic tubing held tight in the connector through which the flexible cord enters the connector, provided for the protection of the flexible cord at the point of entry to the connector, and regarded as part of the connector.

2.7 Type Tests — Tests carried out to prove conformity with the requirements of this specification. These are intended to prove the general qualities and design of a given type of appliance-connector.

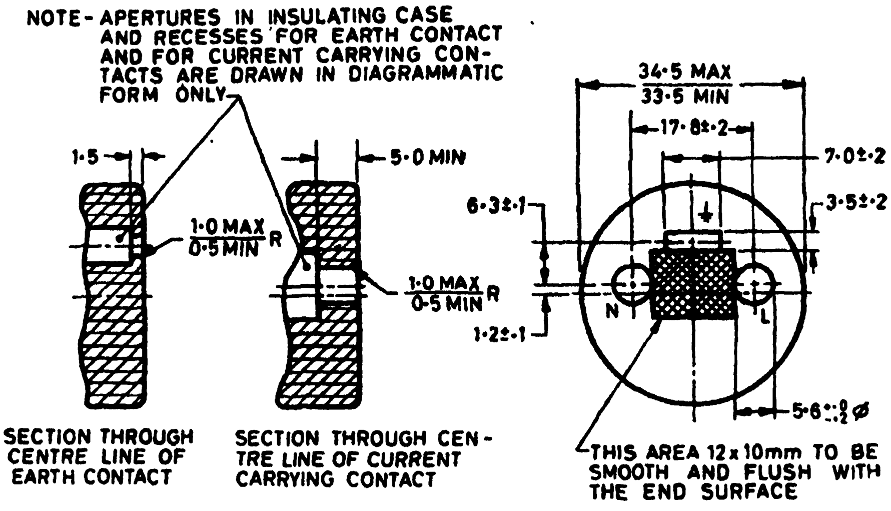
2.8 Routine Tests — Tests carried out on each appliance-connector to check requirements which are likely to vary during production.

2.9 Acceptance Tests — Tests carried out on samples of appliance-connectors taken from a lot for the purpose of acceptance of the lot.

2.10 Stroke — An insertion or withdrawal of the connector from the appliance-inlet.

3. DIMENSIONS

3.1 The dimensions of appliance-connectors made in accordance with this standard, shall conform to dimensions specified in Fig. 1 or 2.



NOTE - APERTURES IN INSULATING CASE AND RECESSES FOR EARTH CONTACT AND FOR CURRENT CARRYING CONTACTS ARE DRAWN IN DIAGRAMMATIC FORM ONLY

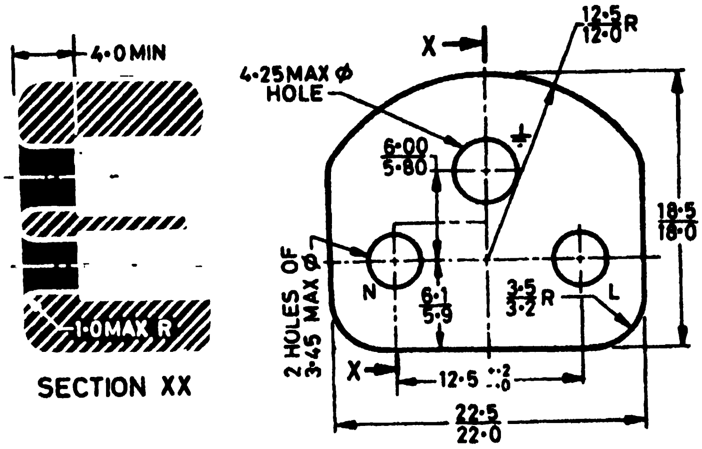
SECTION THROUGH CENTRE LINE OF EARTH CONTACT

SECTION THROUGH CENTRE LINE OF CURRENT CARRYING CONTACT

THIS AREA 12 x 10mm TO BE SMOOTH AND FLUSH WITH THE END SURFACE

All dimensions in millimetres.

FIG. 1 APPLIANCE-CONNECTORS 15A



All dimensions in millimetres.

FIG. 2 APPLIANCE-CONNECTORS 5A

3.1.1 The dimensions specified are such as to secure interchangeability and to provide inaccessibility of live parts.

4. MATERIALS

4.1 The relevant provisions of **7.11** and **7.12** of IS : 302-1973* shall apply in addition to those specified in **4.1.1** and **4.1.2**.

4.1.1 The current carrying and earthing parts of the connectors, and terminals and connecting screws shall be made of phosphor bronze or brass or any other suitable material resistant to oxidation and atmospheric corrosion at the maximum temperature to be expected under normal conditions of service.

4.1.2 The casing or cover of the appliance-connector shall be made of tough non-hygroscopic insulating material having adequate heat resisting properties. It may be made of thermosetting moulding compound or be of a combination of two parts, one made of a thermosetting compound and the other made of suitable ceramic material.

5. CONSTRUCTION

5.1 Relevant provisions of **7** of IS : 302-1973* shall apply in addition to those specified in **5.1.1** and **5.1.4**.

5.1.1 *General* — The appliance-connectors shall be so designed that there is no risk of accidental contact between the earthing contact of an

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*General and safety requirements for household and similar electrical appliances (*fourth revision*).

appliance-inlet and the current-carrying contacts of the appliance-connector (when it is being inserted into the appliance-inlet).

5.1.2 *Position of Contacts* — When viewed from the aperture end of the connector, the contacts shall have the relative positions shown in Fig. 1 or 2.

5.1.3 *Insulating Case or Cover* — The end of the insulating case or cover which is inserted into an appliance-inlet shall not exceed the outside dimension shown in Fig. 1 for a length of at least 30 mm in the case of 15-A appliance-connector and those shown in Fig. 2, for a length of at least 17·5 mm in the case of 5-A appliance-connectors.

5.1.3.1 A smooth and level area is to be provided, flush with the end surface of the case or cover suitable to withstand pressure from a safety device intended to eject the connector from an appliance-inlet.

5.1.4 *Apertures for Entry of Pins* — Apertures in the insulating case or cover shall have rounded edges to facilitate the entry of the pins of the appliance-inlet, and shall have the dimensions shown in Fig. 1 or 2.

5.1.5 *Current-Carrying and Earthing Contacts* — The contacts shall be self-adjusting so as to provide adequate contact pressure and shall make and maintain effective electrical and mechanical contact with the appropriate pins of the appliance-inlet. The contacts shall be so shaped at the point of entry as to afford easy access for the pins of the appliance-inlet; and means for producing contact pressure shall be permanently associated with each contact independently. They shall permit full insertion of the connector into the appliance-inlet.

5.1.5.1 Earthing contact of the connector shall be so designed as to make contact with the earthing-pin of the appliance-inlet before and break contact after the current-carrying contacts of the connector make and break contact with the corresponding pins of the appliance-inlet.

5.1.6 The contacts of appliance-connector shall be locked against rotation.

5.1.7 Enclosures of connectors shall consist of more than one part and shall completely enclose the terminals and the ends of the flexible cable or cord. The construction shall be such that the connectors can be properly connected and cores kept in place so that there is no risk of contact between them from the point of separation of the cores to the terminals.

5.1.8 Parts of the body of connector shall be reliably fixed to one another and it shall not be possible to dismantle the connector without the aid of a tool. There shall be at least two independent means for fixing and locating the parts of the body with respect to each other, at least, one of which, for example a screw, can only be operated with the aid of a tool; self-tapping screws shall not be used for this purpose. The resiliency of the contacts shall not depend upon the assembly of the parts of the body.

Partial loosening of assembly screws or the like shall not allow the detachment of parts providing protection against electric shock.

5.1.9 The earthing contact of connectors shall be fixed to the body. If the earthing contact and the earthing terminal are not in one place, the various parts shall be fixed together by riveting, welding or in a similar reliable manner. The connections between the earthing contact and the earthing terminal shall be of metal which is resistant to corrosion.

5.1.10 Connectors shall be so designed that if after the connectors have been correctly fitted, a conductor or a strand escapes from a terminal, there is no risk of:

a) part of a conductor straying outside the enclosure or coming into contact with accessible screws or the like,

b) contact between live parts and parts of the earthing circuit, and

c) contact between live parts of different polarity.

6. GENERAL AND SAFETY REQUIREMENTS

6.1 Protection Against Electric Shock

6.1.1 Appliance-connectors shall be so designed that live parts, and the earthing contact and parts connected thereto, are not accessible when the connector is wired as in normal use. It shall not be possible to make connection between a contact of a connector and a pin of an appliance-inlet as long as any of the pins is accessible. It shall not be possible to remove parts preventing access to live parts without the aid of a tool. The means of fixing these parts shall be insulated from live parts. Bushes, if any, in the entry holes for the pins shall be adequately fixed and it shall not be possible to remove them without dismantling the connector. External parts of the connector, with the exception of assembly screws and the like, shall be of insulating material.

6.1.2 With the exception of the front edges of the current carrying and earth contacts, the visible metal parts shall be insulated from current carrying or earthed parts. Metal parts which may become live or connected to earth in the event of failure of insulation shall also be inaccessible

6.2 Temperature-Rise — The provisions of Table 3 of IS : 302-1973* shall apply in addition to **6.2.1**.

6.2.1 The temperature-rise at terminals and termination of contacts shall not exceed 30 deg C.

6.3 Electrical Insulation — The provisions of **11.1** (except of **11.1.1**) of IS : 302-1973* shall apply.

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*General and safety requirements for household and similar electrical appliances (*fourth revision*).

6.4 Creepage Distances and Clearances — The provisions of **24** of IS : 302-1973* shall apply.

6.5 Moisture Resistance — The provisions of **13** of IS : 302-1973* shall apply.

6.6 Withdrawal Pull — The pull necessary to withdraw a connector from an appliance-inlet shall be within the limits specified below:

	Withdrawal Pull in kgf	
	Min	*Max*
15A	1·0	3·5
5A	0·25	1·35

6.7 Mechanical Strength — The provisions of **15** of IS : 302-1973* shall apply.

6.8 Heat Resistance — Appliance-connectors shall withstand the heating to which they may be subjected by an appliance. They shall be so designed and connected that the insulation of the cases and of the flexible cable or cord is not subjected to excessive heating.

6.9 Connection of Flexible Cord — The provisions of **20.3**, **20.4** and **20.6** of IS : 302-1973* shall apply in addition to **6.9.1** and **6.9.2**.

6.9.1 *Cord Guard* — A tough rubber sleeve or other suitable non-metallic means shall be provided for preventing sharp bending of, and mechanical damage to the flexible cord where it enters the connector and shall be such that it will not become detached under normal conditions of use.

6.9.2 Insulating barriers securely fixed into, or forming an integral part of the connector shall be provided to separate metal at different potentials, including bared flexible conductors within the connector.

6.10 Terminals — The provisions of **21** of IS : 302-1973* shall apply in addition to **6.10.1** to **6.10.3**.

6.10.1 Contact pressure at connections shall not be transmitted through materials that are liable to deteriorate or shrink.

6.10.2 Terminals shall be so designed that shrinkage or deformation of any insulating material supporting them shall not cause failure to provide adequate electrical continuity.

6.10.3 The terminals shall be permanently identified by the symbols *L*, *N* and ⏚ ' to correspond with the positions of the contacts shown in Fig. 1 or 2.

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*General and safety requirements for household and similar electrical appliances (*fourth revision*).

6.11 Provision for Earthing — The provisions of 22 of IS : 302-1973* shall apply.

6.12 Screws and Connections — The provisions of 23 of IS : 302-1973* shall apply.

6.13 Resistance to Rusting — The provisions of 7.33 of IS : 302-1973* shall apply.

7. ELECTRICAL REQUIREMENTS

7.1 Effectiveness of Contacts

7.1.1 *Current-Carrying Contact* — The voltage-drop between a current-carrying contact and the corresponding pin of an appliance-inlet shall be less than 50 mV at the rated current.

7.1.2 *Earthing Contact* — The voltage-drop between an earthing contact and the corresponding pin of an appliance-inlet shall be less than 50 mV at 1·5 times the rated current.

7.2 Breaking Capacity — The appliance-connectors shall have adequate breaking capacity.

8. ENDURANCE

8.1 The appliance-connector shall be so designed and constructed as to prevent, in extended normal use, any excessive wear or other harmful effects due to mechanical, electrical and thermal stresses. In addition, the insulation shall not be damaged and contacts and connections shall not work loose by heating, vibration, etc.

9. MARKING

9.1 The connectors shall be clearly and indelibly marked with the following:

a) Manufacturer's name or trade-mark;
b) Voltage and current rating;
c) Symbols *L*, *N* and ⏚ to identify the terminals of line, neutral and earthing contacts respectively; and
d) Country of manufacture.

9.1.1 The appliance-connectors may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations

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*General and safety requirements for household and similar electrical appliances (*fourth revision*).

made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

10. TESTS

10.1 Categories of Tests

10.1.1 *Type Tests* — The tests specified in Table 1 shall constitute type tests and shall be carried out on five samples of appliance-connectors of the same rating, selected preferably at random from a regular production lot.

10.1.1.1 *Criteria of acceptance* — All samples shall successfully pass all the type tests for proving conformity with the requirements of this standard. If any of the samples should fail in any of the type tests, testing authority at its discretion may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test(s) in which failure(s) occurred. No single failure shall be permitted in the repeat test(s).

10.1.2 *Acceptance Tests* — The following shall constitute acceptance tests:

Tests	*Clause Reference*
a) Visual examination and inspection	10.3.1
b) Gauging of dimensions	10.3.2
c) High voltage test	10.3.5
d) Test for insulation resistance (dry)	10.3.6
e) Test for protection against electric shock	10.3.7
f) Test for effectiveness of contacts	10.3.8
g) Test for withdrawal pull	10.3.9
h) Test for moisture resistance	10.3.10
j) Test for temperature limit	10.3.11
k) Test for breaking capacity	10.3.12

10.1.2.1 A recommended sampling procedure for acceptance tests is specified in Appendix A.

10.1.3 *Routine Tests* — The following shall constitute routine tests:

Test	*Clause Reference*
a) Visual examination inspection	10.3.1
b) High voltage test	10.3.5
c) Test for insulation resistance (dry)	10.3.6
d) Test for protection against electric shock	10.3.7

10.2 General Conditions for Tests — Unless otherwise specified in the relevant clauses, the conditions specified in 26 of IS : 302-1973* shall apply.

10.3 Schedule of Type Tests — Schedule of type tests to be carried out on the appliance-connectors for proving conformity with the requirements of this standand is given in Table 1 with suitable references to relevant clauses of this standard and those of IS : 302-1973*.

TABLE 1 SCHEDULE OF TYPE TESTS

Sl No.	Test	Clause Reference
1	Visual examination and inspection	10.3.1
2	Gauging of dimensions	10.3.2
3	Cord-grip	33 of IS : 302-1973*
4	Cord guard	34 of IS : 302-1973*
5	Resistance to rusting	37 of IS : 302-1973*
6	Heat resistance	10.3.3
7	Mechanical strength	10.3.4
8	High voltage	10.3.5
9	Insulation resistance (dry)	10.3.6
10	Protection against electric shock	10.3.7
11	Effectiveness of contacts	10.3.8
12	Withdrawal pull	10.3.9
13	Moisture resistance	10.3.10
14	Temperature limit	10.3.11
15	Breaking capacity	10.3.12
16	Endurance	10.3.13
17	Screws and connections	35 of IS : 302-1973*
18	Creepage distances and clearances	48 of IS : 302-1973*

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

10.3.1 *Visual Examination and Inspection* — The appliance-connectors shall be visually examined and inspected for conformity with the relevant requirements specified in 4, 5, 6 and 9.

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*General and safety requirements for household and similar electrical appliances (*fourth revision*).

10.3.2 *Gauging of Dimensions* — The dimensions of connectors shall be verified by suitable inspection gauges.

10.3.3 *Test for Heat Resistance* — The connector shall be fitted with a three-core cable having a cross-sectional area of 1·5 mm^2 and shall be so mounted as 'to be in full engagement with a test inlet, having pins of minimum dimensions specified in IS : 3010 (Part II)-1965*.

It shall remain in the test inlet for 96 hours, the temperature at the base of pins of the test fixture being maintained at 155° ± 2°C throughout this period.

10.3.3.1 During this test, the temperature-rise at the point of separation of the cores of the flexible cords or cables shall not exceed 35°C. Temperatures are determined by means of suitable thermocouples.

10.3.3.2 After removal from the test inlet, the connector is allowed to cool to the ambient temperature and then it is inserted into and withdrawn from the appliance-inlet 10 times.

10.3.3.3 After the test, the connector shall show:

a) no damage affecting the protection against electric shock;
b) no loosening of electrical and mechanical connections; and
c) no cracks, swelling, shrinkage or the like.

10.3.4 *Test for Mechanical Strength* — The mechanical strength of the connectors shall be tested in a tumbling barrel (Fig. 3), the samples being allowed to fall from a height of 500 mm on to a steel plate of 3 mm thickness. The connectors shall be fitted with suitable flexible cord of a length of approximately 100 mm measured at the entrance of the guard. Terminal screws and assembly screws are tightened with two-thirds of the torque specified in Table under **35.2** of IS : 302-1973†. The barrel is turned at a rate of 5 rev min, 10 falls per minute thus taking place. Only one sample shall be taken at a time and the sample shall be allowed to fall 100 times. After the test no part shall become detached or loosened or broken. The sample shall not have suffered any damage impairing safety.

10.3.5 *High Voltage Test* — This test shall be carried out in accordance with **42.3** of IS : 302-1973†, the test voltage being applied between the following parts:

a) *With the connector in complete engagement with an appliance-inlet*
   1) Between live parts of different polarity;
   2) Between all live parts connected together and the other metal parts insulated therefrom;
   3) The earthing terminal and visible metal part, excluding the contacts;

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*Appliance-connectors and appliance-inlets (non-reversible three-pin type): Part II Appliance-inlets.

†General and safety requirements for household and similar electrical appliances (*fourth revision*).

4) Between all live parts connected together and fixing screw or the like; and

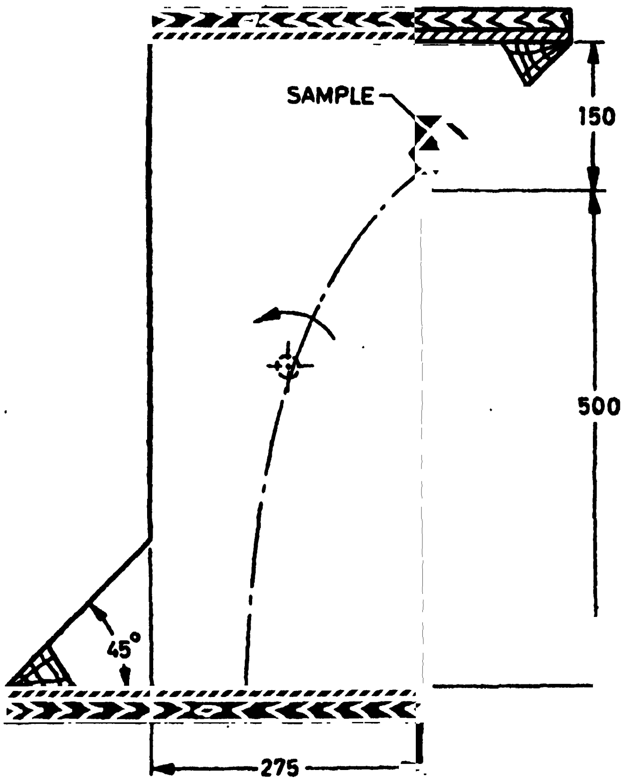
5) Between all live parts connected together and parts of the earthing circuit.

b) *With connector not in engagement with an appliance-inlet*

1) Between all live parts (which are for the purpose of this test connected to the parts of the earthing circuit) and a metal foil in contact with the accessible parts of insulating material including the engagement face; and

2) Between all live parts (which are for the purpose of this test connected to the parts of the earthing circuit) and the accessible assembly screws or the like.

NOTE — High voltage test as a routine test may comprise the flash test specified in 42.3.3 of IS : 302-1973*.



All dimensions in millimetres.

FIG. 3 TUMBLING BARREL

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*General and safety requirements for household and similar electrical appliances (*fourth revision*).

10.3.6 *Test for Insulation Resistance (Dry)* — Insulation resistance shall be measured in accordance with **44.3** of IS : 302-1973*, between the parts specified in **10.3.5**.

10.3.7 *Test for Protection Against Electric Shock* — This test shall be carried out in accordance with **40** of IS : 302- 1973*, with an appliance-connector having the minimum outside dimensions specified in Fig. 1 or 2 either in partial or in complete engagement with an appliance-inlet.

10.3.8 *Test for Effectiveness of Contacts*

10.3.8.1 The voltage drop between an individual current-carrying contact in a complete connector and the corresponding pin of an appliance-inlet shall be measured between the terminal of the contact-tube and that end of the pin remote from the contact-tube, when carrying the rated current. In this test the pins shall be of brass, and of the minimum dimensions specified in IS : 3010 (Part II)-1965†. The voltage drop shall not exceed 50 mV.

10.3.8.2 The voltage drop between the earthing contact in a complete connector and the corresponding pin shall be measured between the terminal of the earthing contact and that end of the pin remote from the contact when carrying 1·5 times the rated current. In this test, the pins shall be of brass and of the minimum dimensions specified in IS : 3010 (Part II)-1965†. The voltage drop shall not exceed 50 mV.

10.3.8.3 The connector and the test inlet shall be connected according to the circuit diagram shown in Fig. 4. When the connector is slowly inserted into the inlet, the lamp *A* shall light before the lamp *B* and shall remain alight. The connector shall then be withdrawn slowly from the fixture and the lamp *B* shall be extinguished before lamp *A*.

10.3.9 *Test for Withdrawal Pull* — This test shall be carried out with the temperature at the base of the test inlet, maintained at 155° ± 2°C. The withdrawal pull of a connector shall be measured along a line parallel to, and mid-way between, the centres of the current-carrying pins. To check the minimum withdrawal pull, the test-inlet shall have pins of minimum dimensions specified in IS : 3010 (Part II)-1965† while the maximum withdrawal pull shall be checked with test-inlets having pins of maximum dimensions specified in IS : 3010 (Part II)-1965†.

10.3.10 *Moisture Resistance Test* — No flexible cable or cord shall be connected to the connector for this test. The test shall be carried out in accordance with **43** of IS : 302-1973* except that the period of conditioning shall be 168 hours.

10.3.11 *Test for Temperature Limit* — Connectors shall be fitted with a three-core cable having a cross-sectional area of 1·5 mm^2 with the terminal screws being tightened with two-thirds of the torque specified in Table under 35.2 of IS : 302-1973*. The connector shall be inserted into an appliance-inlet having brass pins with the minimum dimensions specified in IS : 3010 (Part II)-1965† An alternating current of 1·25 times the rated current shall be passed through the current-carrying contacts for one hour. Current shall then be passed through one current-carrying contact and the earthing contact for one hour. The temperature of terminals and termination of contacts, which may be determined by means of suitable thermocouple, shall not exceed 45°C.

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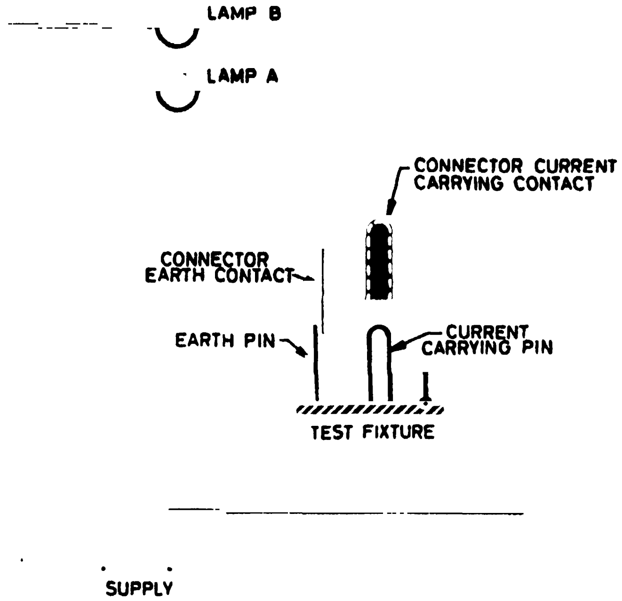
*General and safety requirements for household and similar electrical appliances (*fourth revision*).

†Appliance-connectors and appliance-inlets (non-reversible three-pin type): Part II Appliance-inlets.



1. Push connector slowly into full engagement with test fixture and note that indicator lamps light in the following sequence:
   a) Lamp 'A' only,
   b) Lamps 'A' and 'B' together.
2. Withdraw connector from test fixture and note that indicator lamps go out in the following sequence:
   a) Lamp 'B',
   b) Lamp 'A'.

Fig. 4 Test Circuit for Contact Sequence

10.3.11.1 The test for effectiveness of contacts (*see* **10.3.8**) shall then be repeated.

10.3.12 *Test for Breaking Capacity* — The connector shall be inserted and withdrawn from the appliance-inlets 50 times (100 strokes) at the rate of

---

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

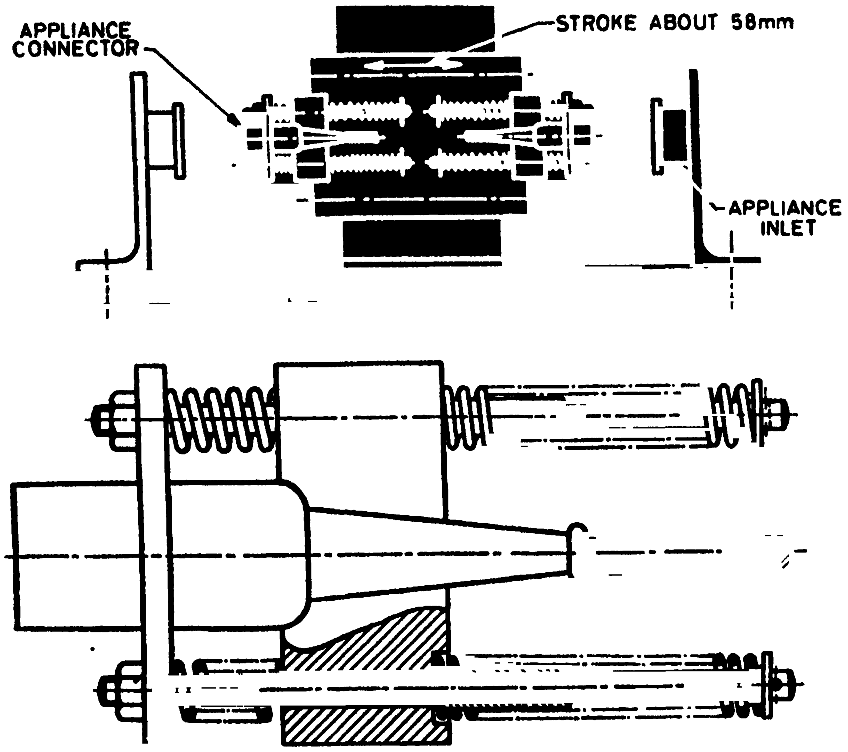
†Appliance-connectors and appliance-inlets (non-reversible three-pin type): Part II Appliance-inlets.

30 strokes per minute at a test voltage of 1·10 times the rated voltage and at a test current of 1·25 times the rated current. The test shall be made with dc in a non-inductive circuit and no current is passed through the earthing circuit.

10.3.12.1 During this test there shall be no flashover between live parts of different polarity or between such parts and parts of the earthing circuit; neither shall there be any sustained arcing.

10.3.12.2 After the test there shall be no damage impairing their further use and the entry holes for the pins shall not show any serious damage. The contact resistance shall be measured after this test and no change in its value is permitted.

10.3.12.3 A typical apparatus is shown in Fig. 5.



The springs shall be so chosen and adjusted that:

a) in the disengaged position they exert a force on the connector carrier equal to 0·9 times the relevant minimum withdrawal force specified in 6.6;

b) when compressed by ½ of the difference between the length in the disengaged position and the fully compressed length, they exert a force equal to 1·2 times the relevant maximum withdrawal force specified in 6.6.

FIG. 5 TYPICAL APPARATUS FOR BREAKING CAPACITY AND ENDURANCE TESTS

10.3.13 *Test for Endurance* — The connectors shall be inserted into and withdrawn from the appliance-inlet 1 000 times at rated current and 3 000 times without current flowing at the rate of 15 strokes per minute. The test shall be made on ac circuit with a power factor of unity. No current shall be passed through the earthing circuit. The apparatus specified in **10.3.12.3** may be used.

10.3.13.1 After the test, the samples shall be visually examined for wear sufficient to impair its use, deterioration of the enclosures, appreciable damage of inlet openings for the connector contacts; and loosening of electrical connections. After the visual examination, the connectors shall be subjected to the following tests:

a) High voltage (*see* **10.3.5**),

b) Effectiveness of contacts (*see* **10.3.8**), and

c) Withdrawal pull (*see* **10.3.9**).

APPENDIX A

(*Clause* 10.1.2.1)

SAMPLING PROCEDURE FOR ACCEPTANCE

A-1. LOT

A-1.1 In any consignment, all the appliance-connectors of the same make, model and type, and manufactured under similar conditions of production shall be grouped together to constitute a lot.

A-2. SELECTION OF SAMPLE

A-2.1 From each lot, a certain number of appliance-connectors as prescribed in Table 2 shall be selected at random and subjected to tests specified in **10.1.2**.

A-2.2 The number of appliance-connectors to be selected shall depend upon the size of the lot and shall be in accordance with col 2 of Table 2.

A-2.2.1 If required for repeat tests (*see* **A-3.2**) additional number of appliance-connectors given in col 3 of Table 2 shall be selected at random.

A-3. CRITERION FOR CONFORMITY

A-3.1 The lot shall be considered as conforming to the requirements of acceptance tests if the number of failures in the first sample is less than or equal to acceptance number C_1 given in col 4 of Table 2. If the number of failures is greater than or equal to the rejection number C_2, as given in col 5 of Table 2, the lot shall be considered as not conforming to the requirements of the acceptance tests.

TABLE 2 SAMPLE SIZE AND CRITERION FOR CONFORMITY

(*Clauses* A-2.1, A-2.2, A-2.3 *and* A-3.1)

LOT SIZE	FIRST SAMPLE N_1	SECOND SAMPLE N_2	ACCEPTANCE NUMBER C_1	REJECTION NUMBER C_2
(1)	(2)	(3)	(4)	(5)
Up to 50	5	10	0	2
From 51 to 100	7	14	0	2
„ 101 „ 200	10	20	0	3
„ 201 „ 300	13	26	0	3
„ 301 „ 500	20	40	1	4
„ 501 and above	25	50	1	5

A-3.2 If the number of failures is between C_1 and C_2, a further sample of N_2 appliance-connectors shall be selected and subjected to the acceptance tests. If the number of failures in the two samples combined is less than C_2 the lot shall be considered as conforming to the requirements of the acceptance test, otherwise not.

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AMENDMENT NO. 4 OCTOBER 1978

TO

IS:3010(Part I)-1965 SPECIFICATION FOR APPLIANCE-CONNECTORS AND APPLIANCE-INLETS (NON-REVERSIBLE THREE-PIN TYPE)

PART I APPLIANCE-CONNECTORS

Alterations

(*Page 4, clause 1.1, line 2*) - Delete the words '5A and'.

(*Page 5, clause 3.1, line 2*) - Substitute 'Fig. 1' *for* 'Fig. 1 or 2'.

(*Page 6, Fig. 2*) - Delete.

(*Page 7, clause 5.1.2, line 2*) - Substitute 'Fig. 1' *for* 'Fig. 1 or 2'.

(*Page 7, clause 5.1.3, lines 4 and 5*) - Delete the words 'and those shown in Fig. 2, for a length of at least 17.5 mm in the case of 5-A appliance-connectors'.

(*Page 7, clause 5.1.4, line 3*) - Substitute 'Fig. 1' *for* 'Fig. 1 or 2'.

(*Page 9, clause 6.10.3, line 2*) - Substitute 'Fig. 1' *for* 'Fig. 1 or 2'.

(*Page 13, clause 10.3.2*) - Substitute the following for the existing clause:

'10.3.2 *Gauging of Dimensions* - The dimensions of the connectors shall be verified by suitable gauges or any other appropriate method.'

(Page 15, clause 10.3.7, line 3) - Substitute 'Fig. 1' *for* 'Fig. 1 or 2'.

(ETDC 43)

AMENDMENT NO. 5 APRIL 1980
TO
IS : 3010 (Part I) - 1965 SPECIFICATION FOR APPLIANCE-CONNECTORS AND APPLIANCE-INLETS (NON-REVERSIBLE THREE-PIN TYPE)

PART I APPLIANCE-CONNECTORS

Addenda

(*Page* 3, *clause* **0.3**) — Add the following new clause after **0.3** and renumber the subsequent clauses accordingly:

'**0.4** As mentioned in **0.2** and **0.3**, it is intended that all appliance-inlets and connectors shall be of non-reversible 3-pin type. However, 2-pin reversible type appliance-inlets and connectors (with earthing clip) are required for some of the appliances being manufactured since an immediate changeover may not be possible. To ensure reliability and interchangeability of such reversible type inlets and connectors, Appendix B is included which gives the requirements and methods of test for 10 A 250 V appliance connectors of reversible type with earthing clip which are generally in use and are suitable where the working temperature of current carrying contact does not exceed 150°C. It is felt that the industry will be in a position to fully changeover to non-reversible 3-pin type appliance inlets and connectors by *1 July 1980* and this amendment stands automatically withdrawn after the said date.'

(*Page* 19, *Appendix* A) — Add the following new appendix after Appendix A:

'APPENDIX B
(*Clause* 0.4)

B-1. DIMENSIONS

B-1.1 The dimensions of the appliance connectors shall be as given in Fig. 6.

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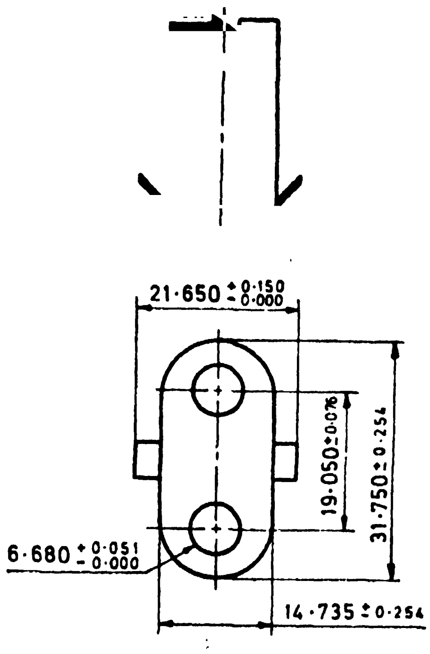


NOTE 1 — The appliance connector shall have two earthing contacts to match the corresponding appliance inlet.

NOTE 2 — The above drawing is not intended to be mandatory as regards the details of construction. The dimensions given are those which are essential for interchangeability and safety in use.

NOTE 3 — The mouth of the contact tube shall not be less than 4·75 mm below the surface of the connector.

All dimensions in millimetres.

FIG. 6 DIMENSIONS OF APPLIANCE CONNECTOR

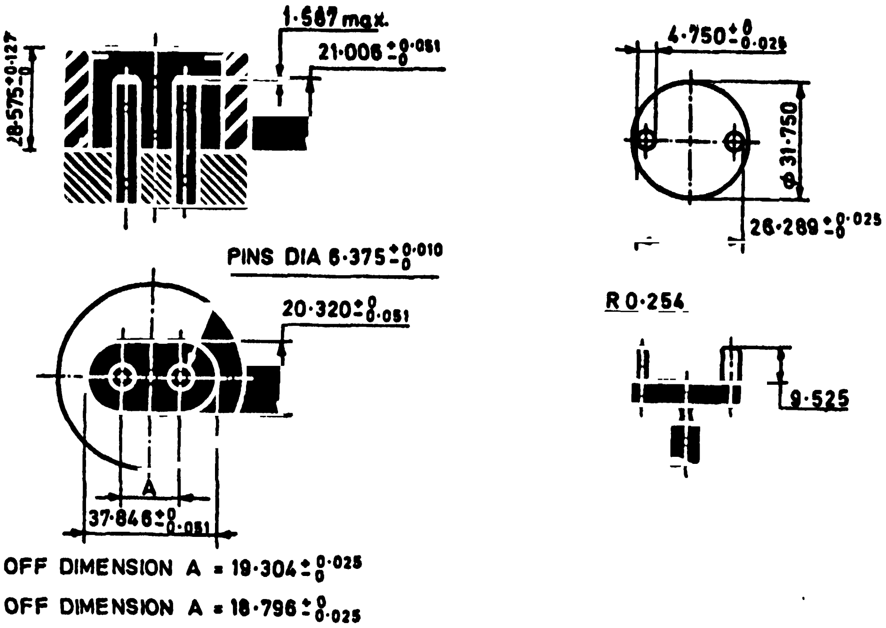
B-1.2 Test for Checking the Dimensions — The dimensions of the appliance connectors shall be checked with appropriate gauges as given in Fig. 7A and 7B or by any other suitable method.

B-2. HIGH VOLTAGE TEST

B-2.1 Appliance connectors shall be tested by an ac test voltage of 1 000 V rms, 50 Hz. The voltage shall be applied for a period of one minute:

a) between contact tubes, and

b) between contact tubes connected together and any other part insulated therefrom including the earthing terminal.



7A Go Gauge For Appliance Connectors

7B Not-Go Gauge for Appliance Connectors

All dimensions in millimetres.

Fig. 7 Gauges For Checking Dimensions of Appliance Connectors

B-3. EFFECTIVENESS OF THE CURRENT CARRYING CONTACTS

B-3.1 The withdrawal pull of a pin having a diameter of 6·25 mm from any individual contact tube in a complete connector shall be measured and it shall not be less than 2·85 N.

B-3.2 The voltage drop between an individual contact tube in a complete connector and a corresponding pin shall be measured between the terminals of the contact tube and the end of the pins remote from the contact tube when carrying a current of 10 A. In this test the pin shall be of brass and of the minimum dimensions indicated in Appendix B of IS : 3010 (Part II)-1965*. The test shall be made immediately following the removal of the inlet connector from the test fixture shown in Fig. 8, the test fixture and the connector having been heated until the temperature of the pins has been raised to 170°C and maintained at this temperature for one hour. The voltage drop shall not exceed 50 mV.

B-4. EFFECTIVENESS OF EARTHING CONTACTS

B-4.1 Effectiveness of earthing contacts of a connector shall be tested by measuring the voltage drop between the earthing terminal of the connector and the single metal plate of the test fixture with the test current of 25 A. The test fixture shall be as shown in Fig. 8. The voltage when measured as stated above shall not exceed 250 mV. The test fixture shall have 2 earthing contacts as shown in Fig. 8.

B-5. MECHANICAL SHOCK TEST

B-5.1 The connector with its associated cord of length approximately 1·2 m shall be supported at *A* as shown in Fig. 9 so that when hanging freely the connector will take the position 1. In this position the connector will be in contact with the hardwood board mounted rigidly with the grain running vertically. The board shall be of about 38 mm in thickness and of sufficient width and so located that the connector when allowed to fall freely, will not strike near the edge of the board. The connector shall be picked up by a moving member at a point on the flexible cord (*B*) and carried to a position where *B* is 1 040 mm from *A* which is vertically above the point of impact of the connector from the board at *C*. When the connector is in position 2 the cord is released from *B*, the connector falls freely through an arc subtending an angle of approximately 90° to strike the board at point *C*. One cycle of the test is completed when the connector moves from the point *C* to the point of suspension below *B* and falls back to the point of impact *C*. The test shall be conducted for 100 cycles. At the end of the test, the connector shall be in serviceable condition and shall meet the requirements specified at **B-1** and **B-2**.

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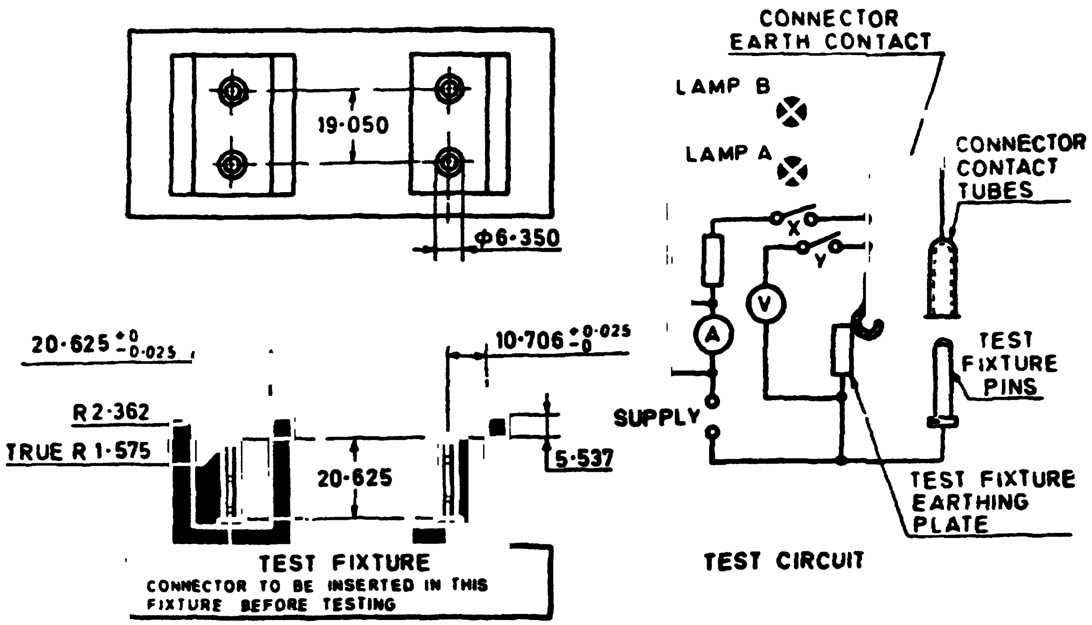
*Specification for appliance-connectors and appliance-inlets (*non-reversible three-pin type*): Part II Appliance-inlets.

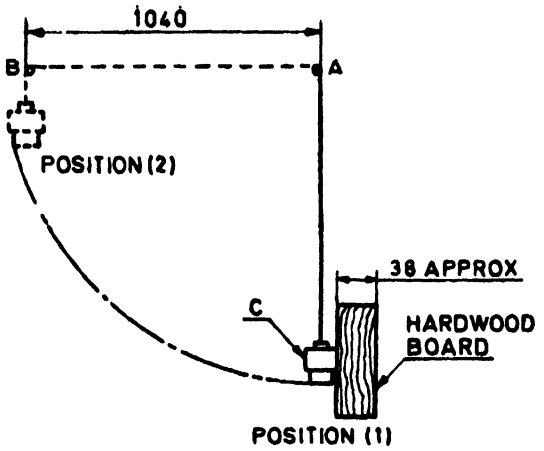


Details of test circuit:

1. With contacts *X* and *Y* open, push connector slowly into full engagement with test fixture, and note that indicator lamps light in the following sequence:
   i) lamp A only, and
   ii) lamps A and B together.
2. Close contact *X*, and check that a current of 25 amperes is flowing.
3. Close contact *Y* and read voltage-drop between connector earth contact and test fixture earthing plate.
4. Open contacts *X* and *Y* and withdraw connector from test fixture.
5. Reverse connector and repeat procedure.

All dimensions in millimetres.

FIG. 8 TEST FIXTURE TO MEASURE RESISTANCE ACROSS EARTH CONTACTS AND TO PROVE EARTH CONTACT MAKE BEFORE LINE AND NEUTRAL



All dimensions in millimetres.

FIG. 9 TEST FIXTURE FOR MECHANICAL SHOCK TEST

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PART I APPLIANCE-CONNECTORS

(*Page* 3, *clause* **0.3**) — Add the following new clause after **0.3** and renumber the subsequent clauses accordingly:

'**0.4** Since the industry has not changed over to the 3-pin non-reversible type appliance inlets and connectors and in view of the proposed mendatory certification of some of the appliances with effect from 1 July 1988, it was decided by the Sectional Committee to allow some more time for the changeover. In consultation with the industry, the committee decided that the changeover would be completed by 31 March 1989. Accordingly, it was decided that this amendment would be withdrawn after 31 March 1989 and the appliance inlets and connectors shall be of 3-pin non-reversible type only after this date. The requirements of 2-pin appliance connectors are given in Appendix B.

(*Page* 19, *Appendix* A) — Add the following new appendix after Appendix A:

'APPENDIX B

(*Clause* 0.4)

REQUIREMENTS OF 2-PIN APPLIANCE CONNECTORS

B-1. DIMENSIONS

B-1.1 The dimensions of the appliance connectors shall be as given in Fig. 6.

B-1.2 Test for Checking the Dimensions — The dimensions of the appliance connectors shall be checked with appropriate gauges as given in Fig. 7A and 7B or by any other suitable method.

B-2. HIGH VOLTAGE TEST

B-2.1 Appliance connectors shall be tested by an ac test voltage of 1 000 V rms, 50 Hz. The voltage shall be applied for a period of one minute:

a) between contact tubes, and

b) between contact tubes connected together and any other part insulated therefrom including the earthing terminal.

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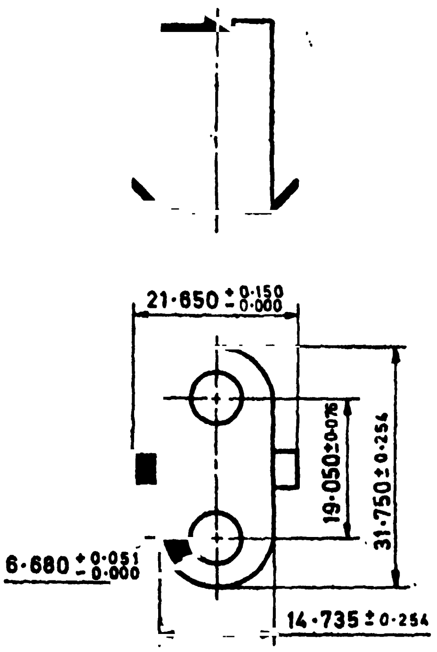


NOTE 1 — The appliance connector shall have two earthing contacts to match the corresponding appliance inlet.

NOTE 2 — The above drawing is not intended to be mandatory as regards the details of construction. The dimensions given are those which are essential for interchangeability and safety in use.

NOTE 3 — The mouth of the contact tube shall not less than 4·75 mm below the surface of the connector.

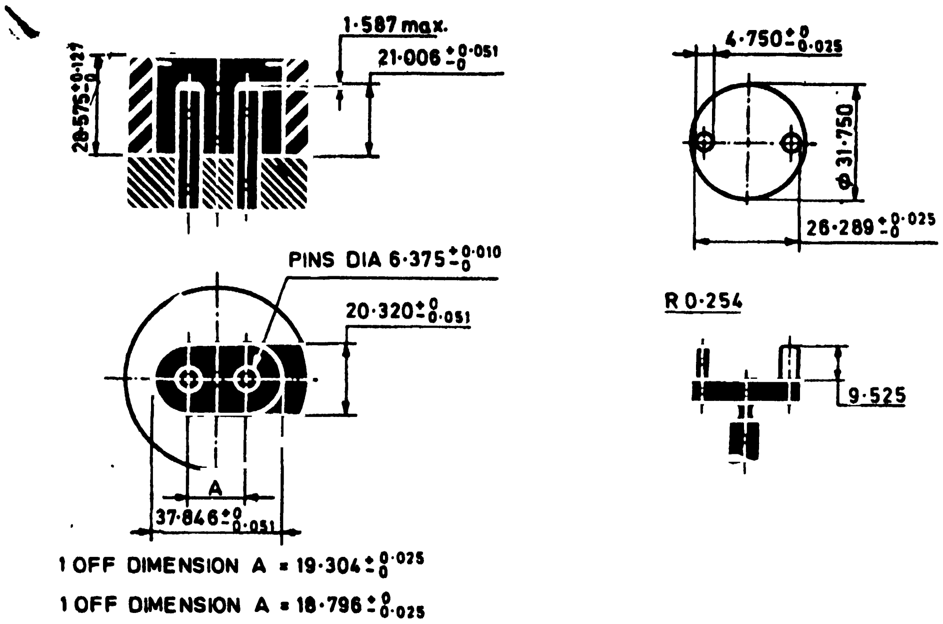
All dimensions in millimetres.

FIG. 6 DIMENSIONS OF APPLIANCE CONNECTOR

B-3. EFFECTIVENESS OF THE CURRENT CARRYING CONTACTS

B-3.1 The withdrawal pull of a pin having a diameter of 6·25 mm from any individual contact tube in a complete connector shall be measured and it shall not be less than 2·85 N.

B-3.2 The voltage drop between an individual contact tube in a complete connector and a corresponding pin shall be measured between the terminals of the contact tube and the end of the pins remote from the contact tube when carrying a current of 10 A. In this test the pin shall be of



7A Go Gauge for Appliance Connectors

7B Not-Go Gauge for Appliance Connectors

All dimensions in millimetres.

FIG. 7 GAUGES FOR CHECKING DIMENSIONS OF APPLIANCE CONNECTORS

brass and of the minimum dimensions indicated in Appendix B of IS: 3010 (Part II)-1965*. The test shall be made immediately following the removal of the inlet connector from the test fixture shown in Fig. 8. The test fixture and the connector having been heated until the temperature of the pins has been raised to 170°C and maintained at this temperature for one hour. The voltage drop shall not exceed 50 mV.

B-4. EFFECTIVENESS OF EARTHING CONTACTS

B-4.1 Effectiveness of earthing contacts of a connector shall be tested by measuring the voltage drop between the earthing terminal of the connector and the single metal plate of the test fixture with the test current of 25 A. The test fixture shall be as shown in Fig. 8. The voltage when measured as stated above shall not exceed 250 mV. The test fixture shall have 2 earthing contacts as shown in Fig. 8.

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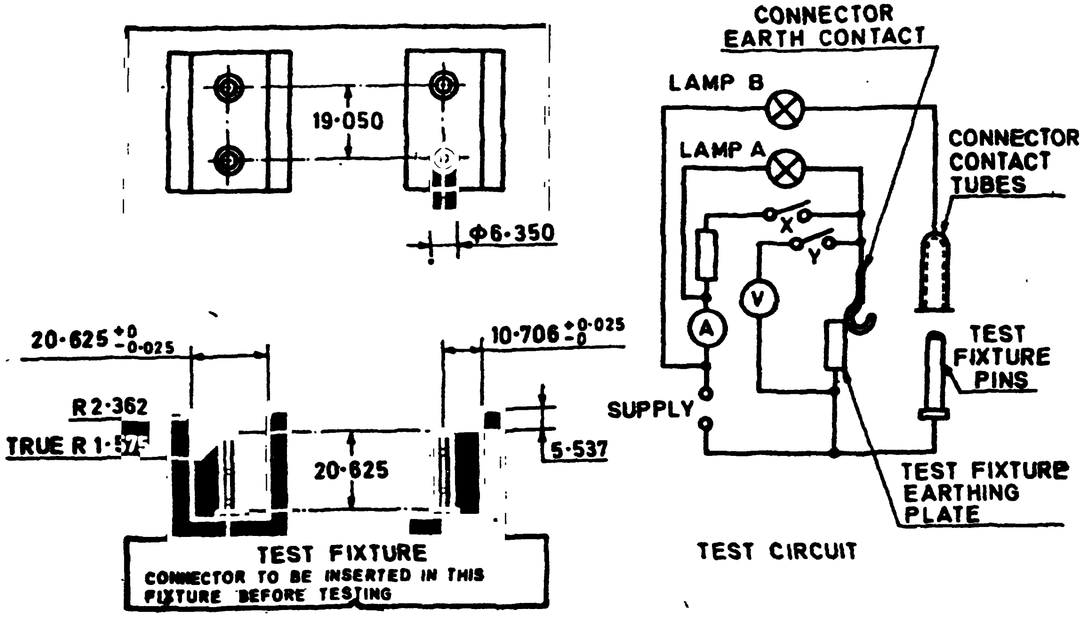
*Specification for appliance-connectors and appliance-inlets (non-reversible three-pin type): Part II Appliance-inlets.



Details of test circuit:

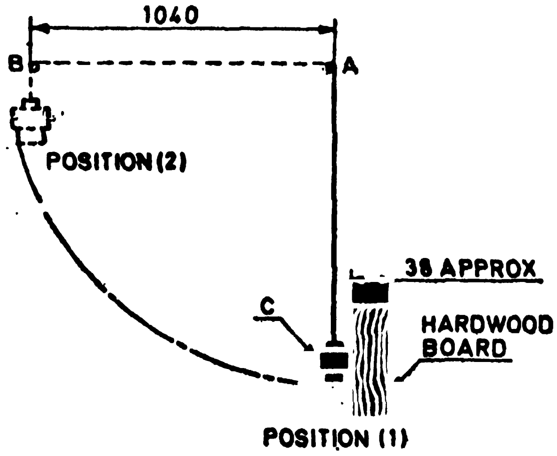
1. With contacts *X* and *Y* open, push connector slowly into full engagement with test fixture, and note tha indicator lamps light in the following sequence:
   i) lamp A only, and
   ii) lamps A and B together.
2. Close contact *X*, and check that a current of 25 amperes is flowing.
3. Close contact *Y* and read voltage-drop between connector earth contact and test fixture earthing plate.
4. Open contact *X* and *Y* and withdraw connector from test fixture.
5. Reverse connector and repeat procedure.

All dimensions in millimetres.

FIG. 8 TEST FIXTURE TO MEASURE RESISTANCE ACROSS EARTH CONTACTS AND TO PROVE EARTH CONTACT MAKE BEFORE LINE AND NEUTRAL

B-5. MECHANICAL SHOCK TEST

B-5.1 The connector with its associated cord of length approximately 1·2 m shall be supported at *A* as shown in Fig. 9 so that when hanging freely the connector will take the position 1. In this position the connector will be in contact with the hardwood board mounted rigidly with the grain running vertically. The board shall be of about 38 mm in thickness and of sufficient width and so located that the connector when allowed to fall freely, will not strike near the edge of the board. The connector shall be picked up by a moving member at a point on the flexible cord (*B*) and carried to a position where *B* is 1 040 mm from *A* which is vertically above the point of impact of the connector from the board at *C*. When the connector is in position 2 the cord is released from *B*, the connector falls freely through an arc subtending an angle of approximately 90° to strike the board at point *C*. One cycle of the test is completed when the connector moves from the point *C* to the point of suspension below *B* and falls back to the point of impact *C*. The test shall be conducted for 100 cycles. At the end of the test, the connector shall be in serviceable condition and shall meet the requirements specified at **B-1** and **B-2**.



All dimensions in millimetres.

FIG. 9 TEST FIXTURE FOR MECHANICAL SHOCK TEST'

(ETDC 43)

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